Queen's Economics Department Working Paper No. 48

" FACTORS INFLUENCING CAREER CHOICES OF STUDENTS:AN EMPIRICAL EXAMINATION OF SOME ASPECTS OF THE NEOCLASSICAL THEORY OF CHOICE IN LABOUR MARKETS"

David A.Dodge
Queen's University

Neil M. Swan
Queen's University

Department of Economics
Queen's University
94 University Avenue
Kingston, Ontario, Canada
K7L 3N6

5-1971

"Factors Influencing Career Choices of Students: An Empirical Examination of Some Aspects of the Neoclassical Theory of Choice in Labour Markets"

David A. Dodge and Neil M. Swan
Assistant Professors, Queen's University

DISCUSSION PAPER NO. 48

May, 1971

INTRODUCTION

The factors which motivate a student to choose a particular career are many; the process of career choice is a complex one. In spite of this complexity, or perhaps because of it, social scientists have developed several theories which purport to explain the process of career decision making. Psychologists and sociologists stress the importance of factors such as need for achievement, peer group attitudes, family background, and cultural norms in their explanations of the choice process. Economists take these factors as given and examine instead the relative importance of the economic costs and benefits in the determination of career choice. Unlike the sociologists or psychologists, however, economists appear to have done little to ascertain to what extent their models of career choice are applicable to the actual decision-making process of students.[1] The general purpose of this paper is to ascertain whether the assumptions of the economist's model are applicable to the process of choice of career. Specifically, we are investigating three aspects of the economist's model.

(1) How applicable is the economist's assumption that students have good knowledge about the relative costs and earnings in different possible careers?

(2) Do students appear to discount future earnings and hence is the "investment" model a relevant one?

---

1. One such attempt is that of R.B. Freeman, The Labour Market for College Manpower, unpublished doctoral dissertation, Harvard University, 1967.

I. THE ECONOMISTS' MODEL OF CAREER CHOICE

(A) The Model

Although economists have treated the problem of career choice in a variety of ways, the simple model given here provides a reasonable synthesis of the many different approaches. For ease of reference, the model is divided into eight parts.

(1) It is assumed that the objective of a student is to choose a career, and a course of study leading to that career, that will enable him to maximize his lifetime welfare. This welfare is derived not only from the income he will earn by pursuing the career, but also from the non-pecuniary benefits stemming from the career such as, for example, the amount of social prestige he derives from the career and the satisfaction he will receive from serving humanity's needs.

(2) It is also assumed that students have perfect knowledge of the economic and psychic benefits they will receive in all careers and of the costs of embarking on those careers.

(3) Finally, it is assumed that students discount future returns at some positive rate.

(4) Economic returns to individual i in career j can then be expressed as

$$P_{ij} = \sum_{t=G+1}^{R} \frac{(W_{ij})_t}{(1+r)^{t-E}} - \sum_{t=E}^{G} \frac{(C_{ij})_t}{(1+r)^{t-E}}$$

Where P_{ij} = present value of lifetime income in career j for the i^{th} individual at the time of his entrance to university,

E = age at entrance to university,

G = age on graduation from university,

R = age at retirement,

$(W_{ij})_t$ = expected annual earnings of individual i in career j at t years of age,

$(C_{ij})_t$ = costs of training at university, both direct costs and foregone earnings,

r = the rate of discount of individual i, and

t = age of individual.

(5) Now consider a career as having a set of attributes such as present value of lifetime income, social prestige, intrinsic satisfaction, security, etc. All careers may be thought to yield some amount, however small, of all attributes. For illustrative purposes consider only two attributes: the present value of lifetime income, i.e., the "pecuniary" attribute,

and all psychic satisfactions received, i.e., the "non-pecuniary" attributes. For example, career A may yield "a" units of the pecuniary attribute and "a'" units of the non-pecuniary attribute per standard work period; similarly career B yields "b" units of pecuniary and "b'" units of non-pecuniary attribute per standard work period. Assuming linearity, careers can now be represented in an "attribute space", as rays through the origin, OA and OB in Figure 1. The individuals tastes for attributes are represented by two indifference curves $M_1M_1^1$, and $M_2M_2^1$. If the individual were free to divide his working time between occupations in the most advantageous way, i.e., such that AB is tangent to $M_1M_1^1$, he would work OA^1 in career A and OB^1 in career B.[2] AB in this model is clearly recognizable as the analog of the budget constraint in the economist's model of consumer choice. However, career choice is a "once and for all" type of decision and hence solutions off the career rays through the origin are not, in general, admissible ones.[2a] A linear activity analysis approach in constructing our theory of career choice yields only a single solution and, hence, is applicable to the problem of career choice.[3]

---

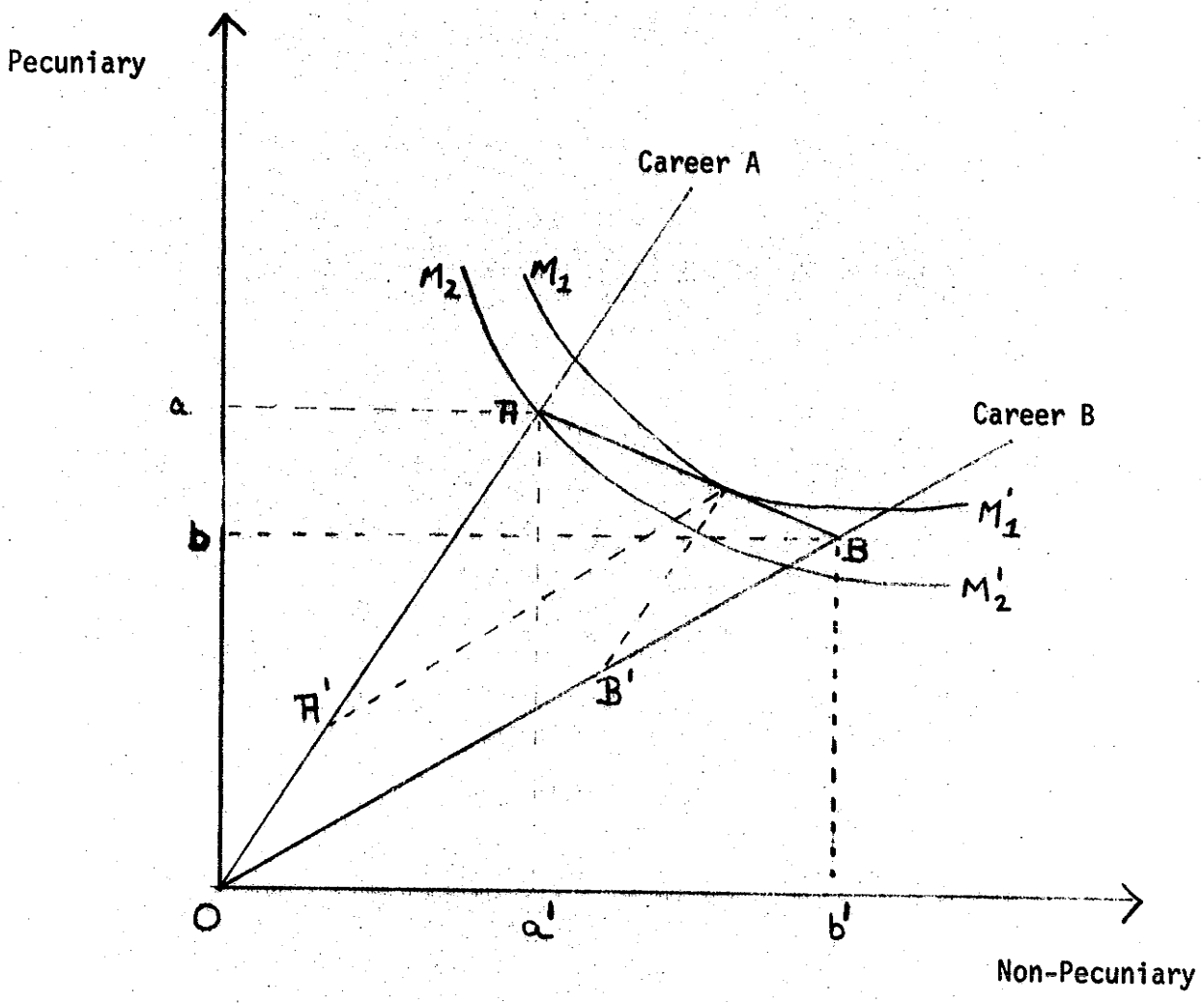
2. We have assumed that the individual is committed to working the "standard work period" each year.

2a. Although an individual might optimally choose to divide his work week equally between neurosurgery, electrical engineering, pearl diving and guiding tourists at the Taj Mahal, this division is clearly not possible; nor in general, is it possible to follow these careers sequentially for periods of a few years each during one's lifetime.

3. See K. Lancaster, "A New Approach to Consumer Theory", Journal of Political Economy (1966), p. 132-157.

FIGURE I-1

Model of Career Choice



(6) In the simple linear model it is assumed that the preference functions are linear. This is, of course, a very stringent assumption in a two-dimensional model for large changes. However, as we are only dealing with points and not a continuous "budget constraint", the assumption of linearity may not be as stringent as it might first appear to be. Our preference function might then take the form of a row vector [n,p], where n and p represent the utilities to an individual of a unit of non-pecuniary attribute and pecuniary attribute respectively. Each career might be thought of as a column vector $[a_p^n]$, where each element represents the number of units of the attribute obtained by working the standard work period in that career. Multiplying these two vectors together yields a single number analogous to the cardinal utility of being in that career. The individual then chooses the profession that yields him the highest cardinal utility.

(7) The analysis is not yet complete, however, for one salient characteristic of occupations and individuals remains to be considered. Individuals possess different abilities, both natural and acquired; occupations require that their practioners possess different abilities, both natural and acquired. One unit of ability may be thought of as commanding different amounts of attributes in

different careers. For example, a unit of mathematical ability may command a higher wage in engineering than in house painting.[4] One economist has described this phenomenon by saying that different occupations have different "loading" factors.[5]

(8) Now consider a career not as a vector of attributes, but as a matrix in which each element represents the amount of a given attribute earned by applying one unit of a given ability that the individual possess. This again yields a vector of attributes that the individual may gain by applying his abilities to a given occupation. As before, multiply this vector by his utility vector and obtain a unique cardinal utility of the career for the individual. The individual performs this calculation for each career and chooses the one which yields him the highest cardinal utility.

---

4. In a perfectly competitive market the wage per unit of ability should be equal for all occupations. In fact some ability may not be fully employed in any given profession. The 'factor loading' or shadow price differs for this reason.

5. B. Mandelbrot, "Paretian Distributions and Income Maximization", Quarterly Journal of Economics, 1962, p. 57ff. See also R.B. Freeman, "The Labour Market for College Manpower", op. cit., Ch. 1.

II. RATIONALITY OF CHOICE

In the human capital model outlined in Section I, a "rational" choice was defined to be one that yielded the highest "cardinal" value taking in to consideration net lifetime earnings, tastes, non-pecuniary returns, and the individual's ability. With the data available we were able to make a crude estimate of the percentage of students whose choice appeared to be "rational" according to the model.

Students were asked to estimate average earnings in the two careers they would most like to follow. They also were asked to say whether they thought their own earnings in these careers would be "above", "about", or "below" average. Finally, as described in Section III below, they were asked a question which enabled us to impute to them a negative, zero or positive rate of time discount. We then made the following assumptions:

(1) "above average" meant 20% above average,

(2) "below average" meant 10% below average,[6]

(3) "negative rate of discount was equal to -2% p.a.,

(4) a positive rate of discount was equal to 5% p.a. and

(5) that they planned to work 44 years (age 22 to 65).

On the basis of these assumptions we were able to calculate the expected present value of lifetime earnings for each of the two careers.

Using the method described in Appendix A (page A-6) we also were able to calculate a "point " score of the non-pecuniary value placed on

---

6. For persons earning more than $5,000 p.a., 20% represents one standard deviation above the mean, and 10% one standard deviation below the mean. (Taxation Statistics, 1968).

each of the two careers by the student. Using the two non-pecuniary point scores and the two present values of lifetime earnings, we could thus devise a weak test of rationality. By weak we mean that a student who passes the test might still be irrational but a student who fails to meet the test is definitely irrational. A student is rational if his preferred career is better in present value of earnings or in non-pecuniary points or in both, i.e., if

$$\text{either} \quad PV_1 > PV_2, \quad S_1 \gtreqless S_2,$$

$$\text{or} \quad S_1 > S_2, \quad PV_1 \gtreqless PV_2$$

where PV_1 is present value of earnings in the preferred career,

PV_2 is present value of earnings in the other career

S_i = non-pecuniary point score in Career i, i = 1,2.

Correspondingly, a student is definitely irrational if he chooses the career which is inferior in at least one respect and superior in neither, i.e.,

$$\text{either} \quad PV_1 < PV_2, \quad S_1 \lesseqgtr S_2$$

$$\text{or} \quad S_1 < S_2, \quad PV_1 \lesseqgtr PV_2.$$

When both $PV_1 \doteq PV_2$ and $S_1 \doteq S_2$, the respondent is not necessarily irrational and hence passes our weak test of rationality.

Of the 843 students who provided all the information necessary to permit calculation of PV_1, PV_2, S_1 and S_2, we found that - 82% were "rational" according to our weak criteria and that 18% were definitely irrational. A classification of respondents by the relative magnitudes of the present values and point scores is found in Table II-1 below.

As our weighting system for the non-pecuniary score is an arbitrary one,

TABLE II - 1

Classification of Career Choice by Relative Present Values of Earnings and Relative Non-Pecuniary Point Scores: All Respondents[1]

Present Value of Earnings \ Non-Pecuniary Score	$S_1 > S_2$	$S_1 \doteq S_2$[2]	$S_1 < S_2$
$PV_1 > PV_2$	360 (43)[4]	54 (6)	56 (7)
$PV_1 \doteq PV_2$[3]	59 (7)	19 (2)	25 (3)
$PV_1 < PV_2$	145 (17)	49 (6)	76 (9)

Number of complete responses = 843
Never intend to follow any career = 8
No response to discount question = 26
Incomplete career earnings data = 254

Total Sample = 1131

Notes:
1. For explanation of calculation of PV_1 and S_1, see Appendix C, Table C-1.1.
2. $S_1 \doteq S_2$ iff $.97\ S_2 \leq S_1 \leq 1.03\ S_2$
3. $PV_1 \doteq PV_2$ iff $.97\ PV_2 \leq PV_1 \leq 1.03\ PV_2$.
4. Figures in brackets are approximate percentages of the 843 respondents in each cell.

we also calculated the values in Table II-1 using a different weighting system. Of the 150 who were judged irrational on our original set of weights, 130 were also irrational using our new set of weights.[7] Thus, 15.4% of respondents appear to be irrational under both sets of weights. There are no standards by which we can judge whether or not this is a sufficient level of irrationality to render inapplicable the assumptions of the rationality in the human capital model, however.

We could think of only two reasons why many students appeared irrational by our test, namely (1) that their career aims were ill defined or (2) that their parents were pushing them into a career that they would probably not follow in the absence of parental pressure. We were unable to devise a good test for the second hypothesis. To test the first hypothesis we reasoned that -

(a) those aiming for a very specific career goal such as law or teaching should exhibit greater rationality than those with more general career aims;

(b) those who had entered a professional or graduate course indicated more commitment to a specific career than undergraduates.

We used "year of study" as a proxy for "the degree of commitment". Those in professional programs were significantly more rational than those in other programs (Table C 2.2) but those in graduate studies exhibited the same degree of irrationality as undergraduates. Thus our hypothesis could not be rejected, but neither was it totally supported by the data.

---

7. In addition, 7 persons judged rational using our first set of weights were judged irrational using the new weights. A complete outline of the new test is given in Appendix C, Tables C 1.2 and C 2.4.

Summary:

In this section we have attempted to discover whether the assumption of "rationality" of choice outlined in Section I applied to students. Using strong criteria for "irrationality", we concluded that about 15% of students appear to make irrational career choices given the information available to them and their own stated preferences.

Some of these irrational students may appear so because of parental influence on career choice or because they really have not come to any firm decision on a career. We were unable to test the first hypothesis, but from our findings we are certainly not able to reject the second.

III. IMPLICIT RATE OF TIME DISCOUNT

In assessing private returns to investment in human capital we normally assume that persons discount future earnings at some positive rate. Most ex post studies of this return to investment in human capital have calculated private present values of lifetime earnings using rates of discount varying between zero and ten percent. In order to find out whether or not this assumption about the rate at which students discount earnings conformed with actual student behaviour, we asked students to tell us which of two lifetime earnings profiles they preferred.[9] Both profiles yield approximately the same undiscounted present value of lifetime earnings, but at positive rates of one percent or more the "flat" age earnings profile (Career Y) yields a higher net present value than does the steeply rising one (Career X).[10] Of the 1105 students who responded to this question, 52.2% said

---

9. The question read as follows: "Suppose you were trying to choose between two careers which were the same in all respects except income. The average annual incomes in the two careers at different ages are:

	Age 25	Age 40	Age 55
Career X	$5,000/year	$10,000/year	$15,000/year
Career Y	$9,000/year	$10,000/year	$11,000/year

Which do you prefer?"

10. Assuming respondent planned to begin working at age 21 and retire at age 65. Present values of lifetime earnings at selected discount rates are as follows:

Discount Rate	Career X (rising)	Career Y (flat)	X/Y
	(All earnings in $'000)		
-4%	1520	1270	1.20
0	460	445	1.04
1	355	360	.99
3	225	245	.91
5	150	180	.83
10	70	100	.70

they preferred Career Y to Career X, indicating that they have an implicit rate of discount on earnings greater than one percent. Another 12.7% of the students reported that they were indifferent between the two earnings streams, indicating that they have an implicit rate of discount of about zero. However, over one-third of the sample, 35.1%, indicated that they preferred career X to Career Y, indicating that they have a negative implicit rate of discount on earnings. As such a large fraction of the sample appeared to have this "perverse" implicit rate of discount, we thought it worthwhile to try to explain this. We tested three hypotheses:

(a) Those with "perverse" time preferences for earnings streams are likely to be those with the highest levels of "other income", mainly parental support,

(b) Those with "perverse" time preference are likely to be those who have a taste for "advancement", or "status", and

(c) Those with "perverse" time preference are more likely to be male than female as girls do not expect to have a long or continuous attachment to the labour force.

The detailed results of these tests are reported in Appendix C. Here we present a quick summary only.

(a) As proxy measures for parental support we used the following:
   1. high family income,
   2. father in high status occupation,
   3. high percentage of cost of university born by parents, and,

4. no previous extended work experience.

We found that:

(1) The mean income of parents of students with implicit negative discounts rates was $2,000 p.a. higher than the mean income of parents of students with implicit positive discount rates (significant at .01 level).

(2) The parents of those with implicit negative discount rates were more likely to be in a high status occupation than were the parents of those with implicit positive discount rates (not significant),

(3) The mean percent of funds to finance university coming from parents was significantly higher (28% compared with 24%) for those with implicit negative discount rates than it was for those with implicit positive rates, and

(4) Thirty-six percent of those reporting one year or more of work experience had implicit negative discount rates compared with 41% of those with less than one year work experience (not significant).[11]

(b) As proxies for taste for "advancement" and "status", we used the following variables:

1. high taste for "opportunities for advancment", and
2. high taste for "social prestige."[12]

---

11. See Appendix C, Tables C-3.2 to C-3.4 for detailed findings.

12. Question 12, items 1, 4 and 5, Importance of Characteristic Rates on seven point scale (1 = unimportant, 7 = most important).

We found that:

(1) The mean value of "opportunities for advancement" was significantly higher (at. .01 level) for those with implicit negative rates of time discount than for those with positive rates (5.96 vs 5.58 on 7 point scale).

(2) The mean value of "social Prestige" was significantly higher (at .05 level) for those with negative rates than for those with positive rates (3.67 vs. 3.50 on 7 point scale).[13]

(c) We hypothesize that more males are likely to have an implicit negative rate of discount than are females for the reasons given above. This hypothesis was confirmed by our finding that 37.1% of males have an implicit negative discount rate compared to only 30.0% of females.

Conclusion:

A very large fraction of the sample (37% of males, 30% of females) appear to have implicit negative rates of time discount. A further 12% of males and 13% females appear to have a rate of time discount of about zero. In other words only half of the students surveyed appear to discount future earnings at all. This finding has the implication that it is inappropriate to use rates of discount of five or ten percent in computing private returns to investment in education as is normally done in studies of returns to investment in university training. Moreover, since the appropriate social rate of discount is thought to be in the order of 10%

---

13. See Appendix C, Table C-3.2 for detailed evidence.

per year, it appears that the average private rate of discount, as seen by the student at university, is less than the social rate rather than greater as is normally assumed. This implies that the private present value of additional earnings resulting from university training exceeds the social (or total) present value by even more than has been estimated by Stager, Dodge, Wilkinson and Podoluk.

Those with implicit negative rates of discount of future earnings are those for whom one would predict low (but not negative) rates of discount of earnings on conventional theoretical grounds. Those with implicit negative rates of discount:

(a) come from higher income homes than do those with zero or positive rates of discount,

(b) have a greater taste for "advancement" and "status" than do those with zero or positive rates of discount, and

(c) are more likely to be male than female.

IV. ACCURACY OF INFORMATION

The third assumption of the human capital model of career choice which we wish to examine is the assumption that students have good information about the returns from their investment in human capital and the costs of making that investment. In this section we examine briefly the accuracy of students' knowledge of starting salaries of bachelors' degree graduates, set out the labour market implications of erroneous earnings information, and examine students' estimates of cost of training.

Estimates of Starting Salaries

The mean estimates of starting salaries are presented in Table IV-1 below and the estimates classified by the sex, faculty, and year of the student are found in Appendix Tables B-3(a) and B-3(b). In general students are low in their estimates of starting salaries. An overall low estimate does not lead to non-optimal investment in human capital providing that the absolute differences are correct; hence the overall lowness of the estimates is not by itself a disturbing finding. What is important is that the absolute differences be correctly estimated if individuals are to make optimal decisions on the basis of the human capital model. At the very least there should be a strong correlation between the true absolute differences and the estimated ones.

For males we constructed a measure of the error in estimating the absolute differences between occupations. We define this measure as

$$E = \sqrt{\frac{\sum_{i=1}^{6}\sum_{j=i}^{7}\left[(X_i - X_j) - (T_i - T_j)\right]^2}{21}}$$

Where X_i = estimated earnings of graduates in i^{th} discipline

X_j = estimated earnings in j^{th} discipline

T_i = true mean earnings of graduates in the i^{th} discipline

i = 1,7 for the disciplines listed in Table IV-1 excluding nursing.

The mean value of E for 729 male respondents was \$910 with a standard error of \$670. As the mean value of $[T_i - T_j]$ is \$610, the mean error appears quite large. Indeed, for only 69% of the students was the correlation between $[T_i - T_j]$ and $[X_i - X_j]$ significantly greater than zero at the one percent level. Moreover as the mean E for male freshmen was approximately \$230 higher than the mean E for all males, it would appear that freshmen have poor information on which to base career decisions. Students in professional programs have the best information. The mean E for male law, M.B.A. and education students is approximately \$200 below the average for all males. Final year male students and graduate students have errors very close to the mean error for all males.

As a final measure of accuracy we computed the number of males students for whom the correlation between their estimates and true values of the starting salaries in the seven disciplines was significantly greater than zero at the one percent level of the 729 respondents, 532, or 73%, achieved a correlation significantly different from zero. Thus, even by this relatively weak measure of accuracy, over one quarter of the male students appear to have very poor knowledge of salaries.[14]

---

14. Detailed descriptive statistics are found in Appendix C, Tables C-4.1 to C-4.3.

We now turn from a description of the "inaccuracy" of students' knowledge of starting salaries to an analysis of the labour market implications of this inaccuracy. In Table IV-2 we present the relative errors of undergraduates males in estimating starting salaries in seven disciplines. The data revealed several interesting points: (1) All faculty/year groups underestimate the starting salaries of pass arts graduates; the underestimate of arts freshmen and fourth-year humanists is so great that their adjusted mean estimate falls at or below the lst decile of actual starting salaries. (2) All faculty/year groups overestimate the relative starting salaries of engineers. For all groups except final year honours science students, the estimate of the relative starting salaries of mechanical engineers lies above the 9th decile of actual starting salaries. (3) All freshmen slightly underestimate relative starting salaries of commerce graduates, all final year students slightly overestimate them. (4) Estimates of the relative starting salaries in biology are good for all groups; estimates of the relative starting salary in sociology are low for most groups; estimates of the relative starting salary in history are low for arts freshmen, for final year social science and for final year pass arts students but are about right for final year humanists.

The implications of these findings are the following:

(1) More male freshmen enroll in honours arts or commerce compared to pass arts than would do so if information were accurate.

(2) More male students enroll and remain in an engineering compared with arts or commerce than would do so were information accurate. Hence imperfect information leads to a greater supply of

TABLE IV - 2

Adjusted Absolute Errors in Estimates of Starting Salaries
by Male Undergraduates by Discipline

Faculty, Year & Discipline	Number of Observations	Mean Error For 7 Fields	Adjusted Error by Field[1] (rounded to nearest $100)						
			Commerce	Pass Arts	Honour Biology	Honour History	Honour Sociology	Mechanical Engineering	Mining Engineering
		$							
FIRST YEAR:									
Arts[2]	100	+150	-100	-600	0	-400	-200	+700	+500
Engineering	135	-400	-200	-400	+100	-200	+100	+400	+200
FINAL YEAR:									
Commerce	15	+ 20	+400	-300	0	-400	-200	+400	+300
Social Science	13	- 70	+500	-300	-100	-500	-300	+400	+300
Science, Math	18	-300	+300	-400	-100	-100	0	+100	+200
Humanities, Languages	10	-140	+100	-700	-200	+100	-300	+300	+200
Pass Arts	41	-200	+100	-400	0	-500	+400	+400	+700
Engineering	114	-490	+100	-400	0	-400	+300	+300	+400

Notes: 1. Method of calculating adjusted error is described in Appendix C, Table C-4.

2. First Year Arts includes First Year Commerce.

engineering graduates (as of 1969) than would be the case if information were accurate.

(3) There appears to be some tendency for males to overenroll in commerce vis-a-vis social science because of poor information.

(4) There also appears to be some tendency for males to underenroll in history (as a proxy for the humanities) vis-a-vis other honours programs because of poor labour market information.[15]

As can be seen from Table IV-3, female undergraduates display a remarkable consistency across disciplines and years in the type of misinformation they possess:

(1) All female undergraduate discipline/year groups underestimate nursing starting salaries.[16] For this reason there appears to be a smaller supply of nurses (as of 1969) than would be the case if information were accurate.

---

15. Actually these four tendencies are even stronger than they appear to be on basis of Table IV-2 since the true values of starting salaries are for all graduates including females. As female graduates receive lower salaries than do males and since they are concentrated in pass arts and honours humanities and social science, true mean starting salaries for males in these disciplines are higher than the means for all graduates, and the magnitude of the underestimates in these fields greater than those shown in Table IV-2.

16. This adjusted underestimate is conservative for the reasons outlined in the previous footnote.

TABLE IV-3

Adjusted Absolute Errors in Estimates of Starting Salaries by Female Undergraduates by Discipline

	No. of Observations	Mean Error	Adjusted Error by Field[1] (rounded to nearest $100)					
			Commerce	Pass Arts	Honours Biology	Honours History	Honours Sociology	Nursing Science
FIRST YEAR: ARTS[2]	95	-360	0	-200	+400	0	+200	-400
FINAL YEAR:								
SCIENCE, MATH	10	-350	+300	-200	+400	0	0	-500
HUMANITIES, LANG.	11	-1180	+700	-700	+400	0	-300	-100
PASS ARTS	56	-430	+500	-300	+200	-100	0	-300

Notes: 1. Method of calculating error is described in the notes to Table C-4. in Appendix C.

2. First year Arts includes first year Commerce.

(2) All discipline/year groups underestimate the salaries of pass arts graduates vis-a-vis graduates of honours programs, especially biology.[17] Hence there appears to be some tendency for female undergraduates to enroll in honours programs, especially pure science, than would be the case if information were perfect.

It may be argued that accurate information for the career one intends to pursue is more important than accurate information for careers which one has no intention of following. For this reason we calculated in Table C-4-1 the mean errors made by prospective male managers, engineers, scientists, lawyers and teachers. We found that prospective managers were most accurate in their estimation of starting salaries in commerce, prospective engineers most accurate in their estimation of starting salaries in engineering, prospective scientists most accurate in their estimation of starting salaries in engineering, and prospective teachers most accurate in their estimation of starting salaries of pass and honours arts students. These findings indicate that the poor knowledge of salaries in general may not be quite as serious as it appeared at first glance. Students may initially pick a career on the basis of imperfect knowledge of salaries and then obtain information on the intensive margin about the potential career or two they are considering. If this search yields information very different from their initial beliefs, they may then obtain more information on the extensive margin which may cause them to alter their choice of career. On the other hand, if their

---

17. This adjusted underestimate is likely to be slightly exaggerated for the same reasons mentioned in footnote 15.

search on the intensive margin yields information which corresponds closely to their initial beliefs, they may not pursue search again on the extensive margin. The evidence in Table C-4-1 is consistant with this hypothesis. Hence non-optimal career choices still occur in the absence of accurate information on the extensive margin, even if students have good information about their first choice of career.

A second measure of accuracy of knowledge on the intensive margin is the accuracy of lifetime earnings profiles in the career chosen by a student. In Table IV-4 below we present the mean estimates of male students of the earnings profiles in their chosen career. With the exception of prospective scientists who on average have very accurate knowledge of earnings in their chosen career, male students appear to overestimate average earnings in their prospective career, especially for the years near retirement.

It is interesting to note in passing that it is in careers normally pursued in the private sector that overestimates appear greatest. This may have the effect of causing more people to pursue careers in the private sector than would be the case if information were more accurate.

Estimates of Costs

In general students underestimate the cost of the university training normally required to enter their chosen career. The main reason for this underestimate is that so few students (only 2.3% of the total sample) explicitly consider foregone earnings as a cost of university training. This is offset somewhat by the fact that 60.4% of the sample explicitly considered living costs as a cost of going to university. How-

TABLE IV-5

Estimated Costs of Qualification for Selected Careers by Sex

Career and Approximate Years of Formal Training		Approximate true cost of Qualification[1]	MALES			FEMALES		
			Number of Observations	Estimated Cost	S.E.of Estimate	Estimated Cost	S.E.of Estimate	Number of Observations
					(dollars/year)			
Manager	(4 U.G.,2G.)[2]	$26,000	991	$20,700	$16,800	-	-	-
Engineer	(4 U.G.)	17,000	206	13,300	11,300	-	-	-
Scientist	(4 U.G.)4 G.)	24,000[3]	52	19,100	17,500	13,900	3,300	20
Lawyer	(3 U.G.,3½ G.)	30,000	12	17,500	15,700	19,600	12,000	14
Teacher	(4 U.S., 1 G.)	20,000	63	16,700[4]	16,000	7,300	3,200	118
Social Worker	(3 U.G., 2 G.)	21,000	-	-	-	8.400	7.100	21

Notes:

1. Includes fees, books, equipment and foregone earnings only. The estimates of foregone earnings are based on the following approximate monthly opportunity costs for both sexes:

   $400/mo. Arts 1, 2, 3, Eng. 1, 2.
   $500/mo. Arts 4; M.B.A. 1; Eng. 3,4; Grad. Sci. 1,2; Law 1, 2, 3; Social Worker 1,2; Education 1.
   $600/mo. M.B.A. 2; Grad. Sci. 3,4; Law Bar Admission.
   Fees, books, and equipment cost approximately $600 per academic year.
   Note: Although we have assumed opportunity costs to be the same for males and females, in most cases they are probably somewhat lower for females.

2. U.G. - years of undergraduate training. G. - years of training in university after the first degree.

3. As substantial fellowship aid is available for graduate work in pure sciences, the total cost of $30,000 has been reduced by $6000,the mean value of three years of scholarships.

4. Estimated cost not significantly lower (at .01 level) than approximate true cost for male teachers. For all others, estimates are significantly below the approximate true cost.

in other disciplines, however. The implication of these findings is that imperfect information will tend to cause overenrolment in engineering vis-a-vis arts and science for males, overenrolment in arts and science vis-a-vis nursing for females, and in honours programs (especially pure science) vis-a-vis the three year pass arts program for students of both sexes.

Finally, students appear to overestimate lifetime earnings in their first choice of career and underestimate the costs of becoming qualified to enter that career. In general this will lead students to overinvest in university training for these careers.

V. SUMMARY AND CONCLUSIONS

In this paper we have attempted to examine the neoclassical model of career choice. We recognize that this investigation of economic behaviour of students in choosing careers is only a beginning. Much more research needs to be done before firm conclusions about the applicability of the neoclassical model may be drawn. Nevertheless, we feel our findings are of interest and that we may draw some tentative implications from them.

(1) A significant number of students, 15% of our sample, appear to have chosen (at least tentatively) a career that they feel is inferior to another both in terms of expected earnings and in terms of selected non-pecuniary attributes. There are two possible explanations for this: (a) other non-pecuniary attributes which have not been taken into account, such as parental pressure, may be important deciderata, and, (b) students may not have fully made up their mind about the career they wish to follow. We were not able to test hypothesis (a) but the evidence is consistent with hypothesis (b). We conclude that while there is some evidence of "irrationality" in the career choices of students, this evidence is not strong enough to warrent the rejection of the assumption that students are "rational" as postulated in the neoclassical model.

(2) A large percentage of students, 35%, appear to have a negative implicit rate of time discount on future earnings. A further 12% appear not to discount future earnings. This finding renders suspect the assumption of a rate of discount 5 or 10% usually used to calculate private net present value of investment

in human capital. We conclude that about half of the students do not discount future earnings and that the assumption of a 5 or 10% rate of discount of future earnings is not a realistic one.

This conclusion has important implications for policy to encourage optimal levels of investment in human capital. Most studies have shown that, at rates of discount of five or ten percent, the private net present value of additional earnings due to education exceeds the social net present value. It has been pointed out that this will cause decisions to be made by potential investors in human capital leading to overinvestment in human capital, unless the private rate of discount exceeds the social rate. We have shown that the average private rate of discount is likely to be very close to zero, and hence the magnitude of overinvestment in university education caused by government subsidization will be greater than it had previously been believed to be.

(3) A third assumption of the neoclassical model is that students have accurate knowledge of their prospective earnings in various careers. If students possess a substantial degree of misinformation, then, both for the individual and for society as a whole, choices are likely to be non-optimal. We found that students do possess a substantial amount of misinformation about salaries. For only 69% of male students was the correlation between 21 true and estimated differences in the starting salaries of graduates in different disciplines significantly different from zero. For only 73% of male students was the correlation between 17 true and estimated starting salaries

for graduates in seven disciplines significantly different from zero. The mean estimates of relative starting salaries of pass arts graduates were low for students from all faculties, courses and years. The mean estimates, by female faculty/year groups, of relative starting salaries of nurses were low, while the mean estimates of relative starting salaries in engineering were high for all groups of male students. The effect of this misinformation is likely to be greater than optimal enrolment in engineering and less than optimal enrolment in nursing and pass arts.

We also found (a) that students overestimate lifetime earnings in their first choice of career and (b) that they underestimate the cost of becoming qualified at university for that career, mainly because they neglect to count foregone earnings as a cost. These two findings in conjunction with our finding that only half of the students discount future earnings at a positive rate, imply that students are likely to overinvest in university training. The overinvestment for males is likely to be greatest in law and business and least in pure science and education.

APPENDIX A

Survey Procedure

(a) Sample Design

The population was eight groups of students,[1] and for each group an appropriate sampling frame[2] was available from registration data. Three of these eight groups were subsequently divided into male and female components.

It was considered desirable to achieve a final sample size for each group that would give about the same sampling error of proportion across groups. The total sample from all groups was limited by available funds to a maximum of 2000.[3] It was assumed that since this was

---

1. First-year Arts, First-year Applied Science, Final-year undergraduate Arts, Final-year undergraduate Applied Science, postgraduates, M.B.A., Law, and McArthur College of Education. First-year Arts, final-year Arts and M.C.E. were divided into male and female categories.

2. The final population lists were not available until after sampling procedure was fixed; the only serious error introduced was an underestimate by 25% of the population of 1st year Applied Science students.

3. Number of questionnaires mailed was 1,911.

a mail survey, a response rate of about two-thirds would be achieved, making an effective total sample size of approximately 1267.

Denoting the sampling error for a true group proportion of 50% with some attribute by g_i, the group population size by N_i, and the achieved sample size by n_i, we therefore had:

(1) $$g_i = 50 \sqrt{\frac{N_i - n_i}{N_i - 1}} \sqrt{\frac{1}{n_i}} = g \qquad i = 1 \ldots 8$$ -for sampling without replacement, where g is the common sampling error.

(2) $$\sum_{i=1}^{8} n_i = 1{,}267$$

Equations (1) and (2) were solved for the n_i, which were then grossed up by the inverse of the expected response rate to give the actual sample size for each group. The sample was then drawn by taking a random number to begin with and drawing every k'th individual thereafter.[4]

For the MBA group no sampling fraction, given the expected response rate, would ensure that the sampling error for this group was as small as for the others, so that MBA students were sampled 100% .

---

4. The frames were alphabetical, so no bias should be introduced by this technique.

As might be expected, neither the actual population after registration, nor the response rates, were exactly what we predicted, though they were not greatly different. The results of the sampling procedure are shown in Table A-1. The achieved response rate is the final one after one follow-up mailing of all groups, except freshmen, who received two follow-up mailings. Budget limitations precluded further follow-up mailings.

(b) Questionnaire Design

Except in unusual circumstances, the response rate to a mail survey goes down if the questionnaire is too long. For this reason we limited the questionnaire to four pages, necessarily excluding thereby many questions to which answers would have been interesting.

Section I of the questionnaire - question 1 through 5 - requests general demographic data (age, sex, etc.), whether the respondent has ever worked over 12 months, and how many years of university he has completed.

Section II asks three questions about family background - occupation, education, and income, of the family of the respondent.

Sections I and II jointly provide characteristics of the respondent with which, a priori, one might expect career choice to be related. Section III asks questions about the two careers most relevant to the respondent, while Section IV asks about career information in general.

TABLE A-1

Sample Design

Group	Actual Registered Population	Number Sampled	Achieved Sample Size	Response Rate %	Standard Error of Two Sample Percents** True = 50%	Standard Error of Two Sample Percents** True = 10%
First Year Arts: Total	1237	356	236	66	2.9	1.7
(incl. Commerce) Male	592	170	113	66	4.2	2.5
Female	645	186	123	66	4.0	2.4
First Year Applied Science	367	198	153	77	3.1	1.9
Third & Fourth Year Arts: Total	1337	330	198	60	3.3	2.0
(incl. Commerce) Male	767	189	104	55	4.6	2.8
Female	570	141	94	67	4.7	2.8
Fourth Year Applied Science	292	215	122	57	3.5	2.1
Postgraduate Arts & Engineering*	739	313	159	51	3.5	2.1
Law I and III	245	192	87	45	4.3	2.6
M.B.A. I and II	125	125	73	58	3.8	2.3
McArthur College of Education:						
Total	218	182	105	58	3.6	2.2
Male	84	70	35	50	6.5	3.9
Female	134	112	70	63	4.1	2.5
Total	4560	1911	1133	59	1.3	0.8

*Excluding foreign students.

**The last two columns are interpreted as follows: If the true proportion of the total population with a given attribute were 50%, the standard error of the estimated population would be 1.3%. If the true proportion possessing the attribute were 10%, the standard error of the estimated proportion is 0.8% for the total population.

The first question of Section III, No. 9, tries to pin down the respondent to his two most preferred careers, one of which has to be the one he has chosen if a choice has already been made. The general idea here is that we need to know what immediate alternative faced the respondent, as well as asking him specifically about his most preferred career. Questions 10 through 17 try to elicit how much the respondent knows about the monetary and non-monetary rewards and the monetary costs, of each career, and what his evaluation of them is.

Question 10 asks, for both careers selected, what the respondent thinks average earnings are now, in fifteen years, and near retirement. The answers here can mostly be checked against the actual figures, giving some idea of the accuracy of relevant salary information. The respondent is also asked whether, for each career, he thinks he would earn the average income, or more or less than this. This information is needed to check which career he thinks would yield him highest lifetime earnings.

Question 11 tests specifically whether the respondent discounts future income.

Question 12 and 13 tackle the non-pecuniary aspects of career choice, the object being to get an indication of which of the two careers outranks the other in characteristics other than money. The answer to these questions, in conjunction with the cost and expected income information, provide a rough test of rationality in career choice. For example, if a student had chosen career 1, yet career 2 had greater non-

monetary advantages and greater net income (after cost of training), this might suggest irrationality. Widespread evidence of such irrationality would cast doubt on the whole theory of career choice outlined in Section I, as well as on the efficiency of the labour market in the allocation of human resources.

In question 12 the respondent is asked to weigh career characteristics, according to how important they are to him, on a 1 to 7 scale. In question 13 he is asked to score his two preferred careers according to how strongly they possess each of the characteristics listed in question 12, on a 1 to 5 scale. A different scale was chosen here to try and avoid confusion with question 12.

Applying the weights in question 12 to the scores in question 13, a weighted average measure of the non-pecuniary attractiveness of each career can be calculated, and the two careers compared. An example will clarify this. Suppose in question 12, answers had been as follows:

Career Characteristic	Importance on 1-7 scale
1. Advancement opportunities	2
2. Interest	4
3. Match to abilities	5
4. Security	1
5. Prestige	1
6. Social need	6
7. Other (e.g., chance to travel)	7

and in question 13 answers had been as follows: -

Career Characteristic	Degree of possession by: Dentistry (1-5 scale)	Engineering (1-5 scale)
1	4	3
2	2	5
3	4	4
4	5	3
5	2	2
6	3	1
7	1	4

Then a measure of non-monetary advantages for dentistry would be

$$(2 \times 4) + (4 \times 2) + (5 \times 4) + (1 \times 5) + (1 \times 2) + (6 \times 3) + (7 \times 1) = 68.$$

For engineering it would be

$$(2 \times 3) + (4 \times 5) + (5 \times 4) + (1 \times 3) + (1 \times 2) + (6 \times 1) + (7 \times 4) = 85$$

- so that for this respondent engineering is superior, in its non-monetary aspects, to dentistry.

Question 14 asks what percentage increase in career 2's earnings would induce the respondent to prefer it - an attempt to estimate how strongly income at the margin influences career choice. Question 15 tries to discover whether the rate of growth of earnings during the past few years as opposed to level is important to the respondent as a basis for the formulation of expectations of future earnings. Both question 14 and 15 received answers that indicate that respondents may have misinterpreted the questions. For this reason, a summary of the replies to them has not been included in this report.

Questions 16 and 17 ask about costs of the most preferred career. We were particularly interested here to see if respondents would include foregone earnings as a cost. To avoid leading respondents directly to consideration of this element of cost, no specific elements of cost were mentioned, but space was left for them to be included at the initiative of the respondent. Question 17 asks how the costs would be met, since if

they are mostly non-repayable they are less likely to influence career choice.

In Section IV (question 18 - 21), questions 18 and 19 ask about sources of career information. Question 18 asks for a ranking by importance of possible sources of career information, while question 19 asks if, as a whole, the information was adequate for a wise career choice.

Questions 20 and 21 try to discover, in a limited way, if the respondent's knowledge of careers beyond the two he actually preferred was reasonably accurate. Question 20 asks for the respondent's estimates of length of training in various common careers, while question 21 asks for estimates of starting salaries of graduates with bachelor's degrees in various subject areas. Ignorance about alternatives to the two "most preferred careers" would, like irrationality, cast doubt on the efficiency of market allocation.

APPENDIX B

Summary of Data

(a) Introduction

In this appendix a summary of responses to most of the individual items on the questionnaire is presented for eleven groups of students. These are first and final year Arts (male and female), first and final year Engineering, Law, M.B.A., Graduate, and Education (male and female). For most items the distribution of replies is presented in tabular form for each faculty/year/sex group; where relevant, mean values of the replies are given. No standard errors of proportion are presented in these tables; for estimates of typical errors of proportion for each group the reader should refer to Table A-1.

(b) Family Background

Basic demographic and family background data are presented in Tables B-1(a) and B-1(b). These tables are self-explanatory and need little comment here. However, it should be noted in reference to data on place of residence that the proportions of foreign students sampled was less than the true proportion. In sampling we excluded all students with a mailing address outside Canada in an attempt to limit our sample population to Canadian residents. Among the other items of particular interest are the following findings:

- Of all students working for second or higher degrees, only students of business administration appear to have spent much time in the labour force (56% with one or more years of work experience).

- Girls appear to have had much less labour force experience than have men (9% for girls at McArthur College versus 26% for men; 2% for girls in first-year Arts versus 12% for men).

- Only 17% of male Education students came from families in which at least one parent has a university degree. For no group does this number exceed 41%.

- A very large proportion of Queen's students come from high income families. Forty-two percent of all students surveyed estimated that their family incomes exceeded $11,000 and 13% estimated that their incomes exceeded $25,000 per year. These are extremely large percentages when one considers that less than 20% of Canadian families had incomes exceeding $11,000 in 1969.[14]

- This high average figure conceals large differences in the incomes of parents of students in different faculties. Sixty-six percent of law students come from families with incomes exceeding $11,000 per year while only 23% of the male education students come from such families. Of female students, 60% come from families with incomes of $11,000 or more; the comparable figure for male students is only 37%.

---

14. Accurate distributions of family income are difficult to obtain for recent years. The 20% figure is derived by inflating 1961 incomes by 40% and using census distributions of family income.

TABLE B-1(a)

General Information and Family Background: Percentage Distributions[1], Undergraduates

Question Number	ITEM	All Students N = 1131	1st Arts Male N = 113	1st Arts Female N = 123	1st Engineering N = 152	3rd & 4th Arts Male N = 104	3rd & 4th Arts Female N = 94	4th Engineering N = 121
	Total Response Rate (%)							
1	Residence: Ontario	85.5	84.1	91.1	83.6	89.4	87.2	84.2
	Quebec	6.9	6.2	5.7	8.6	5.7	3.1	10.8
	Other Canada	5.0	7.1	3.3	6.6	4.8	3.1	5.0
	Outside Canada	2.6	2.7	0.0	1.4	0.0	5.3	0.0
3	Marital Status: Percent Married	19.7	5.3	0.8	1.3	10.5	12.7	28.1
5	One or More Years of Full Time Employment: Yes	19.0	12.4	2.4	11.2	16.3	8.5	19.8
6	Parents Education: Both have Degrees	13.5	16.8	15.4	11.2	10.8	19.1	8.3
	Only one has a Degree	22.2	23.9	23.6	22.4	28.8	27.6	28.3
	Neither has a Degree	64.3	59.3	61.0	66.4	60.5	53.1	63.6
7	Father's Occupation: Managerial	27.2	17.7	21.3	21.3	22.1	34.0	35.8
	Professional	27.0	34.5	34.4	25.7	32.6	35.1	21.7
	Clerical	2.3	1.8	2.5	3.3	1.9	2.1	1.7
	Public Service	12.9	13.3	11.5	11.3	10.5	12.7	6.7
	Item Non-Response	0.8	1.8	0.8	1.3	0.0	0.0	0.8
8	Parents' Income: $0- 4,999	8.9	8.1	6.6	9.7	6.7	4.2	10.8
	$5,000 - 7,999	18.0	14.4	21.3	22.9	16.3	11.7	20.0
	$8,000 -10,999	20.1	19.8	15.6	17.4	21.1	13.8	14.2
	$11,000 -15,999	21.9	27.9	19.7	27.1	19.2	25.5	30.8
	$16,000 -24,999	17.8	18.9	22.1	17.4	15.3	23.4	11.7
	$25,000 - +	12.9	10.8	14.8	5.6	21.1	18.0	12.5
	Item Non-Response	2.3	1.8	0.8	5.3	0.0	3.1	0.8

Note 1: Because of rounding error, totals may not sum to 100%. Item non-response was less than 1% for questions 1 through 6. All percentages are adjusted for non-response.

TABLE B-1(b)

General Information and Family Background;Graduates.

Question Number	Item	McArthur College Male N =35	McArthur College Female N = 70	M.B.A. N = 71	Law N = 82	Graduates Arts & Engineering N = 157
	Total Response Rate (%)					
1	Residence: Ontario	94.3	92.9	64.6	85.4	69.0
	Quebec	0.0	5.7	12.3	6.1	8.9
	Other Canada	5.7	1.4	12.3	7.3	19.3
	Outside Canada	0.0	0.0	10.8	1.2	5.5
3	Marital Status: Married	31.4	24.3	45.1	28.0	41.1
5	One or more years of full time employment	25.7	8.6	56.3	19.5	35.6
6	Parents Education:					
	Both have degrees	8.6	10.0	15.5	6.1	12.1
	Only one has degree	8.6	22.9	22.5	23.2	27.4
	Neither has a degree	82.9	67.1	62.0	69.5	60.5
7	Father's occupation:					
	Managerial	20.0	17.6	38.6	86.4	17.6
	Professional, technical	25.7	27.9	28.6	13.6	34.2
	Clerical	0.0	2.9	1.4	0.0	4.3
	Public Service	8.6	13.2	14.3	0.0	34.8
	Item Non Response	0.0	2.9	1.4	1.2	0.8
8	Parents' Income<$5,000/Yr.	17.1	7.4	5.8	4.9	13.3
	$5,000 - $7,999	22.9	23.5	20.3	13.4	12.5
	$8,000 - 10,999	37.1	29.4	24.6	15.9	28.1
	$11,000 - 15,999	8.6	16.2	15.9	18.3	21.7
	$16,000 - 24,999	8.6	14.7	18.8	20.7	15.4
	$25,000 or more	5.7	8.8	14.5	26.8	9.0
	Item Non Response	0.0	2.9	2.8	0.0	5.3

Note: See Table B-1(a)

(c) Career Preference and Information

A summary of findings on career preferences and information is presented in Tables B-2(a) and B-2(b). This table is also self-explanatory and needs little further comment here. The following points are worthy of specific note, however:

- Only 50% of males and 55% of females preferred the earnings stream that would yield a maximum lifetime income at a rate of discount exceeding zero.

- For both males and female students the most important non-pecuniary attribute of a career is its intrinsic interest; the second most important attribute is the extent to which the career matches the student's own abilities. For male students, opportunity for advancement was equally as important as the extent to which the career matches the student's own abilities. Of moderate importance for females were opportunities for advancement, job security, and the extent to which the career met "humanity's needs". While job security was of moderate importance for male students, the extent to which the career met "humanity's needs" was of low importance. Social prestige was also of low importance to both male and female students.

- Graduate students and undergraduate engineering students appear to have good information on the relative

starting salaries of graduates in various disciplines. While estimates of actual starting salaries are slightly low for all eight disciplines, all students grossly underestimate the starting salaries of nurses and general arts students, in some cases by more than $1,000.

(d) Costs and Sources of Funds

Estimates of the average cost of attending university are presented in Table B-3(a) and (b). Again, these tables are self-explanatory and it need only be emphasized that students grossly underestimate the true cost to themselves and their family of attending university. This underestimate appears to occur because so few students consider the opportunity cost of attending university.

(e) Sources of Information

From Tables B-4(a) and (b) it is clear that students do not consider their information on possible careers to be adequate. Moreover, formal channels of information appear to be relatively unimportant in the provision of whatever information students do obtain.

- Overall, about one-third thought that the information available was adequate, one-third thought it was barely adequate and one-third thought it inadequate.

- Teachers and general reading were the most important sources of information in general, closely followed in importance by previous experience in the labour market,

and friends and parents. Guidance, commercial testing and government agencies were of virtually no importance.

- The small importance attached to formal sources of information together with the overall inadequacy of the information received suggests that the formal providers of information must improve greatly their penetration if students are to have better information.

TABLE B -2(a)

Preferences and Salary Information[1]
Undergraduates

Question Number	Item \ Group		All Students	First Arts Male	First Arts Female	First Engineering	Final Arts Male	Final Arts Female	Final Engineering
9a	Have selected career: Yes	%	65.6	41.6	38.0	64.5	47.1	54.2	73.3
11	Income Stream Preference:[1]								
	Prefer 5,000,10,000,15,000	%	35.2	38.9	27.9	34.2	39.4	24.4	40.3
	Indifferent	%	12.5	12.0	16.4	11.2	10.5	6.3	10.1
	Prefer 9,000,10,000,11,000	%	52.2	49.1	55.7	54.6	48.0	63.8	49.6
	Item Non Response	%	1.7	4.4	0.8	0.0	1.9	5.3	1.7
12	Average Importance of Non-pecuniary Characteristics[2]								
	1. Advancement		5.5	5.7	4.9	5.9	5.9	4.9	5.8
	2. Intrinsic Interest		6.3	6.6	6.6	6.4	6.3	6.5	6.2
	3. Matches Abilities		5.7	5.9	6.3	5.9	5.6	5.9	5.5
	4. Job Security		4.3	4.6	4.5	4.9	4.7	4.3	4.1
	5. Social Prestige		3.4	3.2	2.9	3.3	3.5	3.5	3.2
	6. Humanity's Needs		3.6	3.7	4.3	3.3	3.4	4.0	3.0
21	Estimated Annual Starting Salaries in Eight Disciplines for Bachelors Graduates[3]								
	1. Commerce [6960]	$	6,540	6,510	6,180	6,360	6,970	6,570	6,590
	2. General Arts [6360]	$	5,630	5,850	5,640	5,570	5,800	5,410	5,540
	3. Biology (Hons) [7140]	$	6,630	6,670	6,730	6,500	6,770	6,500	6,540
	4. History (Hons) [7020]	$	6,300	6,270	6,510	6,300	6,480	6,330	6,150
	5. Sociology " [6660]	$	6,140	6,310	6,260	6,160	6,210	5,890	6,070
	6. Mechanical Eng. [7500]	$	6,950	6,360	7,080	6,950	6,770	6,500	7,270
	7. Mining Eng. [7860]	$	6,800	6,000	6,570	6,940	6,960	6,340	7,760
	8. Nursing [6300]	$	5,450	5,450	5,560	5,220	5,500	5,380	5,560
	Rank Correlation with True Values (Spearman)		.98	.48	.91	.95	.68	.68	.93

Notes: See Table III-2(b)

TABLE B-2(b)

Preferences and Salary Information[1]
Graduates

Question Number	Item \ Group		College of Education Male	College of Education Female	M.B.A.	Law	Graduate Arts & Engineering
9a	Have Selected Career Yes	%	97.1	100.0	67.6	89.0	84.7
11	Income Stream Preference	%					
	Prefer 5,000,10,000,15,000	%	28.6	24.8	42.8	48.8	35.1
	Indifferent	%	14.3	20.3	8.6	16.0	12.2
	Prefer 9,000,10,000,11,000	%	57.1	44.9	47.1	40.7	52.7
	Item Non-Response	%	0.0	1.4	1.4	1.2	2.3
12	Non-Pecuniary Characteristics[2]						
	1. Advancement		5.1	4.6	6.1	5.9	5.0
	2. Intrinsic Interest		6.2	6.4	6.3	6.3	6.4
	3. Matches Abilities		5.8	6.1	5.9	5.6	5.8
	4. Job Security		4.6	4.7	3.7	4.3	4.3
	5. Social Prestige		3.6	3.3	4.1	4.5	4.2
	6. Humanity's Needs		3.9	4.6	3.3	3.6	3.9
21	Estimated Starting Salaries[3]						
	1. Commerce [6960]	$	6,800	6,460	6,560	6,780	6,560
	2. General Arts [6360]	$	5,910	5,700	5,750	5,650	5,440
	3. Biology (Hons) [7140]	$	7,230	7,120	6,310	6,560	6,490
	4. History (Hons) [7020]	$	6,750	6,600	5,950	6,270	6,020
	5. Sociology (Hons) [6660]	$	6,580	6,320	6,130	6,000	5,960
	6. Mechanical Engineering [7500]	$	7,650	7,170	6,990	7,370	6,940
	7. Mining Engineering [7860]	$	7,690	6,950	7,220	7,500	5,960
	8, Nursing [6300]	$	5,370	5,510	5,250	5,350	5,650
	Rank Correlation with true values		.98	.93	.88	.93	.93

Notes: 1. Percentages have been corrected for non-response.
2. Average ranking on 1 to 7 scale. Seven indicates that the characteristic is very important; one indicates that it is of no importance. Non-response was 1.5%.
3. Figures in square brackets are 1969 average starting salary from Career Outlook. Non-response rates were: Comm.-10.0%; Gen. Arts -10.2%; Biology - 10.6%; History - 10.4%; Sociology - 10.6%; Mechanical Eng. - 9.1%; Mining Eng. - 10.0%, Nursing - 10.1%.

TABLE B-3(a)

Costs and Sources of Funds
Undergraduates

Question Number	Item / Group		All Students	First Arts Male	First Arts Female	First Engineering	Final Arts Male	Final Arts Female	Final Engineering
	Hypothetical Cost[1]	$	-	17,000	16,000	18,000	12,000[2]	11,000[2]	18,000
16	Average Estimated Cost	$	15,600	12,300	9,200	10,200	13,200[2]	7,300[2]	15,400
16	Percent Mentioning Various Sources of Cost:[3]								
	Fees, Books, etc.	%	63.0	48.6	47.2	67.2	30.7	69.1	72.7
	Interest on Loans	%	1.5	0.9	0.0	2.0	1.9	1.0	1.7
	Foregone Earnings	%	2.3	2.7	1.6	4.6	18.2	3.1	23.2
	Living Costs	%	60.4	45.2	46.4	63.2	52.8	64.8	68.6
17	Sources of Funds as Percent of Total Funds:[4]								
	Personal Earnings:								
	0 - 24%	%	25	20	48	18	18	34	7
	25 - 49%	%	36	36	38	35	33	39	35
	50 - 100%	%	39	43	14	47	50	26	58
	Parents:								
	0 - 24%	%	34	26	18	34	30	29	40
	25 - 49%	%	25	32	22	21	26	13	29
	50 - 100%	%	40	42	60	45	42	58	31
	Loans								
	0 - 24%	%	48	35	24	40	48	17	47
	25 - 49%	%	33	37	33	37	28	55	35
	50 - 100%	%	19	29	43	23	24	28	18
	Scholarships								
	0 - 24%	%	60	70	80	74	62	56	59
	25 - 49%	%	25	23	12	21	27	31	32
	50 - 100%	%	15	8	8	4	11	13	9

Notes: 1. Calculated on basis of earnings data interpolated from Career Outlook, percentage of cost borne from loans and average expenditures of fees, etc.
2. For 3 year programme only.

(Continued)

3. Percentage of students who mentioned item implicitly or explicitly.
4. Figures may not sum to 100.0% because of rounding. As only 43% of the sample population gave complete answers to question seventeen, the summary is presented to two digit accuracy only. Reported figures are adjusted for non-response of course. Non-response rates are: Earnings - 9%; Parents - 25%; Loans - 53%; Scholarships - 52%.

TABLE B-3(b)

Costs and Sources of Funds

Graduates

Question Number	Item		College of Education: Male	College of Education: Female	M.B.A.	Law	Graduates: Arts & Engineering
	Hypothetical Cost[1]	$	21,500	20,000	31,000	29,000	-
16	Average Estimated Cost	$	12,200	9,200	26,000	21,300	29,700
16	Percent Mentioning Sources of Cost[3]						
	Fees, etc.	%	68.6	72.9	59.2	64.6	70.7
	Interest	%	0.0	0.0	5.6	2.4	1.9
	Income Earnings	%	8.6	1.4	47.8	15.8	25.6
	Living Costs	%	62.9	65.8	59.2	62.2	68.3
17	Sources of Funds as Percent of Total Funds:[4]						
	Personal Earnings						
	0 - 24%	%	12	35	17	28	24
	25 - 49	%	29	39	33	37	36
	50 - 100	%	59	26	48	36	31
	Parents						
	0 - 24%	%	52	29	41	36	47
	25 - 49	%	32	19	30	25	36
	50 - 100	%	16	52	30	39	18
	Loans						
	0 - 24%	%	57	41	65	57	80
	25 - 49	%	35	32	29	31	16
	50 - 100	%	9	26	6	12	4
	Scholarships						
	0 - 24%	%	83	58	54	78	24
	25 - 49	%	9	28	31	19	36
	50 - 100	%	9	14	15	3	31

Notes: See Table B-3(a)

TABLE B -4(a)

Importance of Various Sources of Career Information[1]
Undergraduates

Question	Source / Group		All Students	1st Arts Male	1st Arts Female	1st Engineering	3rd & 4th Arts Male	3rd & 4th Arts Female	4th Engineering
18	Family								
	Important	%	21.5	27.9	22.3	28.2	59.6	19.1	18.5
	Somewhat Important	%	40.2	42.3	52.1	42.3	40.3	48.9	37.0
	Friends, Relatives								
	Important	%	20.9	21.8	12.3	20.1	20.1	25.5	23.7
	Somewhat Important	%	48.9	49.1	58.2	53.0	48.0	53.1	46.6
	School Guidance								
	Important	%	8.3	12.8	18.3	20.8	3.8	17.0	5.1
	Somewhat Important	%	26.1	38.5	35.8	32.2	20.1	31.9	20.5
	Teachers, Professors								
	Important	%	31.4	32.4	32.5	29.5	25.9	21.2	32.8
	Somewhat Important	%	45.6	43.5	52.5	53.0	40.3	52.1	44.5
	Commercial Aptitude Tests								
	Important	%	5.4	9.3	4.3	8.1	14.4	3.1	4.3
	Somewhat Important	%	20.2	27.1	20.5	33.1	42.3	8.5	17.9
	Previous Employment								
	Important	%	29.9	27.3	17.2	17.4	26.9	25.5	52.5
	Somewhat Important	%	29.8	21.8	28.4	29.5	34.6	30.8	28.3
	Government Agencies								
	Important	%	4.6	5.6	5.1	4.1	6.7	4.2	6.0
	Somewhat Important	%	26.0	23.1	31.4	23.6	25.9	27.6	27.6
	General Reading								
	Important	%	33.5	38.5	42.9	41.1	28.8	27.6	31.1
	Somewhat Important	%	47.7	49.5	46.2	43.7	63.4	59.5	50.4

(Continued)

TABLE B -4(a) (Continued)

Importance of Various Sources of Career Information[1]
Undergraduates

Question	Source \ Group	All Students	1st Arts Male	1st Arts Female	1st Engineering	3rd & 4th Arts Male	3rd & 4th Arts Female	4th Engineering
19.	Overall Adequacy of Information							
	Adequate %	33.7	40.0	26.4	47.3	26.9	28.7	30.0
	Barely %	33.3	33.6	43.0	33.1	25.9	34.0	29.4
	Not Adequate %	33.0	26.4	30.6	19.6	44.2	34.0	40.3

Notes: 1. All percentages are adjusted for non-response which was 3.7% for Question 18 and 2.5% for question 19.

TABLE B -4(b)

Importance of Various Sources of Career Information[1]
Graduates

Question	Source	Group	McArthur College Males	McArthur College Females	M.B.A.	Law	Arts & Engineering
18.	Family						
	Important	%	24.2	20.3	32.8	29.5	19.1
	Somewhat Important	%	36.4	44.9	41.8	28.2	39.2
	Friends, Relatives						
	Important	%	14.7	23.9	0.0	23.7	8.7
	Somewhat Important	%	52.9	41.8	16.1	42.5	31.5
	School Guidance						
	Important	%	0.0	0.0	26.2	2.6	4.6
	Somewhat Important	%	15.6	31.8	46.2	20.5	21.6
	Teachers, Professors						
	Important	%	42.9	38.2	12.5	11.5	27.4
	Somewhat Important	%	34.3	42.6	26.6	47.4	21.6
	Commercial Aptitude Tests						
	Important	%	3.2	1.5	44.9	1.3	6.4
	Somewhat Important	%	3.2	18.2	31.9	15.4	16.4
	Previous Employment						
	Important	%	32.4	30.3	3.2	19.0	33.6
	Somewhat Important	%	29.4	34.8	30.6	30.4	32.6
	Government Agencies						
	Important	%	3.1	3.0	28.8	1.3	8.8
	Somewhat Important	%	18.8	18.2	43.9	17.7	28.4
	General Reading						
	Important	%	18.2	22.1	26.8	34.6	33.8
	Somewhat Important	%	48.5	51.5	40.8	41.0	41.9

(Continued)

TABLE B -4(b) (Continued)

Importance of Various Sources of Career Information[1]
Graduates

Question	Source / Group		McArthur College Males	McArthur College Females	M.B.A.	Law	Graduates Arts & Engineering
19.	Overall Adequacy of Information						
	Adequate	%	32.4	39.1	36.2	28.4	28.6
	Barely	%	35.3	37.7	36.2	29.6	31.2
	Inadequate	%	32.4	23.2	27.5	42.0	40.1

Notes: See Table B -4(a)

APPENDIX C

TABLE C-1.1

Method of Calculating Present Value of Earnings and Non-Pecuniary Point Score

$$S_i = \left[\sum_{j=1}^{m} W_j V_{ij}\right] \Big/ \left[7 / m\right] \qquad \begin{array}{l} m = 6 \text{ or } 7 \\ i = 1,2 \\ j = 1,2,\ldots m \end{array}$$

$$PV_i = 15 \left[\sum_{k=1}^{3} x_i \; E_{ik}/D^{15(k-1)+1}\right]$$

where S_i = weighted non-pecuniary score of career i

PV_i = expected present value of earnings in career i

W_j = weight for characteristic j (Qn. 12).

V_{ij} = degree to which career i possesses characteristics

m = 7 if "other" characteristic is specified, 6 otherwise

E_{ik} = earnings in career i at time k, k = 1,2,3.

x_i = 1.20 if earnings in career i are expected to be above average, .90 if earnings in career i are expected to be below average, 1.00 otherwise

D = .98 if implicit rate of discount is negative, 1.05 if it is positive and 1.00 otherwise.

TABLE C-1.2

Method of Calculating Non-Pecuniary Point Score Using "Squares of Weights"

$$S_i^* = \left[\sum_{j=1}^{m} W_j^* V_j^* \right] \Big/ \left[7 / m \right]$$

$m = 6$ or 7
$i = 1,2$
$j = 1,2,...m$

Where S_i^* = "squares of weights" weighted non-pecuniary score for career i

W_j^* = square of point value given to characteristic j - (Question #12)

V_{ij} = square of point value given to characteristic j in career i (Question #13)

Original range of W_j	:	1	to 7	(mean = 4)
Square range of W_j	:	1	to 49	(mean = 16)
Original range of V_{ij}	:	1	to 5	(mean = 3)
Square range of V_{ij}	:	1	to 25	(mean = 9)
Original range of $W_j.V_{ij}$	:	1	to 35	(mean = 12)
Square range of W_jV_{ij}	:	1	to 1225	(mean = 144)

TABLE C-2.1

Percentage Distribution of Rationality by

Career Choice: All Respondents

Career Chosen	Rational by Weak Test	Definitely Irrational
Business	86.2%	13.8%
Engineering, Science	77.1	22.9
Law	95.8	4.2
Teaching	84.6	15.4
Other	75.9	24.1

$\chi^2 = 26.8^{**}$

N = 843

Notes: ** = significant χ^2 at .01 level.

* = significant χ^2 at .05 level.

N = number of respondents.

(Of course all chi-square tests were performed on actual cell frequenceis. We report percentage distributions here to aid the reader).

TABLE C-2.2

Percentage Distribution of Rationality by Year of Study: All Respondents

Academic Year	Rational by Weak Test	Definitely Irrational
Freshman	80.9%	19.1%
Final Year Undergraduate	81.6	18.4
Graduate	79.0	21.0
Law, M.B.A., Education	90.7	9.3

$\chi^2 = 8.33^*$

N = 843

TABLE C-2.3

Percentage Distribution of Rationality by Education of Parents: All Respondents

Education of Parents	Rational by Weak Test	Definitely Irrational
At least one parent with university degree	85.1%	14.9%
Neither parent with degree	80.7	19.3

$\chi^2 = 4.60$

N = 843

TABLE C-2.4

Comparative Tests of Rationality Using Original Weights and Squares of Original Weights[2,3]

	$S_1 > S_2$	$S_1 \doteq S_2$	$S_1 < S_2$
$PV_1 > PV_2$	360 (371)[1]	54 (30)	56 (69)
$PV_1 \doteq PV_2$	59 (62)	19 (16)	25 (25)
$PV_1 < PV_2$	145 (158)	49 (37)	76 (75)

1. Figures in bracket are cell numbers using squares of original weights.

2. See Table C-1.2 for explanation of "squares of weights" weighting for S_i.

3. Number irrational by both weighting systems = 130
   Number irrational by original weights only = 20
   Number irrational by squares of weights only = 7

TABLE C-3.1

Percentage Distribution of Discount Rates by Sex

	Negative Rate	About Zero	Positive Rate	Total
Male	37.1	12.3	50.6	100.0%
Female	30.0	13.4	56.6	100.0

$\chi^2(3) = 4.96$

$\chi^2(2) = 4.91^{**}$

N = 1105

Item Non-Response Rate: Males: 1.7%

Females:2.2%

Notes: $\chi^2(3)$ = value of χ^2 for division into three discount rate categories: negative, zero and positive.

$\chi^2(2)$ = value of χ^2 for division into two discount rate categories: negative, and zero or positive.

** = significant χ^2 at .01 level.

* = significant χ^2 at .05 level.

N = number of respondents.

(Of course all chi-square tests were performed on actual cell frequencies. We report percentage distributions here to aid the reader).

TABLE C-3.2

Mean Values of Selected Variables by Discount Rate and Test of Differences of Means: Males Only

	(1) Negative Rate	(2) Approx. Zero Rate	(3) Positive Rate	(4) Total Male Sample	(5) Col.(1) minus Column (3)	(6) "t" values for Differences
Opportunities for advancement	5.96	5.66	5.58	5.73	.38	3.8**
Intrinsic Interest of Career	6.46	6.40	6.24	6.34	.22	2.5**
Career Matches Abilities	5.80	5.75	5.67	5.72	.13	1.3
Job Security	4.32	4.13	4.42	4.35	-.10	0.8
Social Prestige	3.67	3.11	3.50	3.52	.17	1.6*
Humanities Needs	3.51	3.81	3.26	3.42	.25	1.7*
Percent of University Costs Borne by Parents	28.5	24.2	24.4	25.9	4.1	2.1**
Parents Annual Income	14,600	15,500	12,600	13,700	2,000	6.7**

* Significant by one tailed test at .05 level.
** Significant by one tailed test at .01 level.